

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

- 1 1. (Currently Amended) A storage area network, comprising:
 - 2 a storage system for providing storage of system data;
 - 3 at least one application host running an application thereon and accessing data on
 - 4 the storage system;
 - 5 at least one I/O performance gateway, disposed between the at least one
 - 6 application host and the storage subsystem, for intercepting I/O operations;
 - 7 ~~a database for storing service level agreements; and~~
 - 8 a Service Level Agreement (SLA) server, coupled in parallel with the at least one
 - 9 I/O performance gateway and the storage system, for controlling the at least one I/O
 - 10 performance gateways based on ~~the service level agreements, wherein the at least one I/O~~
 - 11 ~~performance gateway sending statistic data to the SLA server and taking requests from~~
 - 12 ~~the SLA server to control I/O operations; and~~
 - 13 a database, coupled to the SLA server, for storing service level agreements;
 - 14 wherein the at least one I/O performance gateway sends statistics data to the SLA server
 - 15 and receives I/O control requests from the SLA server to control I/O operations of the
 - 16 performance gateway;
 - 17 wherein the SLA server further comprises:
 - 18 a database manager, coupled to the database, for maintaining connections
 - 19 to the database ~~wherein~~ and for maintaining service level agreements and performance
 - 20 data ~~are maintained in the database;~~

21 an SLA services module for analyzing data and controlling actions based
22 on the service level agreements and policy;
23 an application server for communicating with clients to provide display
24 monitoring information for presentation at an SLA client and ~~for~~ to provide
25 communication ~~with~~ between the database manager and the SLA client; and
26 a performance monitor, coupled to the SLA services module, for
27 communicating with the at least one I/O performance gateway to collect data and send
28 throttling requests based upon signals from the SLA services module, wherein the
29 performance monitor is configured to provide at least one thread pair for processing
30 inbound signals from the at least one I/O performance gateway being sent to the SLA
31 services module via an inbound thread and for processing outbound signals to the at least
32 one I/O performance gateway received from the SLA services module via an outbound
33 thread, the inbound thread and the outbound thread operating asynchronously to provide
34 non-blocking messaging.

1 2. (Original) The storage area network of claim 1 wherein the SLA
2 services module further comprises:
3 a performance analyzer for setting throttling parameters and discovering new i/o
4 performance gateways;
5 an entity service module for providing in-memory caching of collected statistical
6 data by polling data from the i/o performance gateways; and
7 a policy manager for ensuring actions meet service level agreements and policy
8 rules.

1 3. (Original) The storage area network of claim 1 further comprising a
2 storage resource manager for monitoring the storage system.

1 4. (Original) The storage area network of claim 1 wherein the SLA
2 server further includes a mailbox disposed between the SLA services module, the
3 database manager, the application server and the performance monitor, the mailbox
4 providing a non-blocking two-step communication scheme for allowing concurrent
5 servicing of multiple I/O requests and database requests.

1 5. (Original) The storage area network of claim 1 wherein the
2 performance monitor includes a plurality of processors for controlling communication,
3 the at least one thread pair comprising a thread pair for each of the plurality of
4 processors.

1 6. (Original) The storage area network of claim 5 wherein a thread pair
2 for each of the plurality of processors are associated with a subgroup of SLA processes of
3 the SLA services module and a subgroup of gateways.

1 7. (Original) The storage area network of claim 1 wherein the
2 performance monitor includes a single processor for controlling communication, the
3 inbound thread receiving signals from all gateways and providing a path to all processes
4 of the SLA services module communicating with the performance monitor.

1 8. (Currently Amended) A Service Level Agreement (SLA) server,
2 comprising:
3 a database manager, coupled to a database, for maintaining connections to the
4 database ~~wherein~~ and for maintaining service level agreements and performance data ~~are~~
5 ~~maintained~~ in the database;
6 an SLA services module for analyzing data and controlling actions based on the
7 service level agreements and policy;
8 an application server for communicating with clients to provide display
9 monitoring information for presentation at an SLA client and ~~for~~ to provide
10 communication ~~with~~ between the database manager and the SLA client; and
11 a performance monitor, coupled to the SLA services module, for communicating
12 with ~~the~~ at least one I/O performance gateway to collect data and send throttling requests
13 based upon signals from the SLA services module, wherein the performance monitor is
14 configured to provide at least one thread pair for processing inbound signals from the at
15 least one I/O performance gateway being sent to the SLA services module via an inbound
16 thread and for processing outbound signals to the at least one I/O performance gateway
17 received from the SLA services module via an outbound thread, the inbound thread and
18 the outbound thread operating asynchronously to provide non-blocking messaging.

1 9. (Original) The SLA server of claim 8 wherein the SLA services
2 module further comprises:
3 a performance analyzer for setting throttling parameters and discovering new i/o
4 performance gateways;
5 an entity service module for providing in-memory caching of collected statistical
6 data by polling data from the i/o performance gateways; and
7 a policy manager for ensuring actions meet service level agreements and policy
8 rules.

1 10. (Original) The SLA server of claim 8 wherein the SLA server further
2 includes a mailbox disposed between the SLA services, the database manager, the
3 application server and the performance monitor, the mailbox providing a non-blocking
4 two-step communication scheme for allowing concurrent servicing of multiple I/O
5 requests and database requests.

1 11. (Original) The SLA server of claim 8 wherein the performance
2 monitor includes a plurality of processors for controlling communication, the at least one
3 thread pair comprising a thread pair for each of the plurality of processors.

1 12. (Original) The SLA server of claim 11 wherein a thread pair for each
2 of the plurality of processors is associated with a subgroup of SLA processes of the SLA
3 service module and a subgroup of gateways.

1 13. (Original) The SLA server of claim 8 wherein the performance
2 monitor includes a single processor for controlling communication, the inbound thread
3 receiving signals from all gateways and providing a path to all processes of the SLA
4 services module communicating with the performance monitor.

1 14. (Original) A performance monitor for controlling communication
2 between two functional entities, comprising:
3 at least one processor configured for processing signals between at least one I/O
4 performance gateway and SLA services module processes; and
5 a thread pair associated with each of the at least one processors, each thread pair
6 processing inbound signals from the at least one I/O performance gateway being sent to
7 the SLA services module via an inbound thread and for processing outbound signals to
8 the at least one I/O performance gateway received from the SLA services module via an
9 outbound thread, the inbound thread and the outbound thread operating asynchronously
10 to provide non-blocking messaging.

1 15. (Original) The performance monitor of claim 14 wherein the at least
2 one processor comprises a plurality of processors for controlling communication.

1 16. (Original) The performance monitor of claim 15 wherein each thread
2 pair associated with a processor is associated with a subgroup of SLA processes of the
3 SLA services module and a subgroup of gateways.

1 17. (Original) The performance monitor of claim 14 wherein the at least
2 one processor comprises a single processor, the inbound thread receiving signals from all
3 gateways and providing a path to all processes of the SLA services module
4 communicating with the performance monitor.

1 18. (Currently Amended) A program storage device readable by a computer,
2 the medium tangibly embodying one or more programs of instructions executable by the
3 computer to perform a method for providing non-blocking, minimum threaded two-way
4 messaging, the method comprising:
5 providing at least one processor for controlling communication between SLA
6 processes of ~~the~~ an SLA services module and at least one I/O performance gateway; and
7 providing a thread pair associated with each of the at least one processors for
8 processing inbound signals from the at lest one I/O performance gateway being sent to
9 the SLA services module via an inbound thread and for processing outbound signals to
10 the at least one I/O performance gateway received from the SLA services module via an
11 outbound thread, wherein the inbound thread and the outbound thread operate
12 asynchronously to provide non-blocking messaging.

1 19. (Original) The program storage device of claim 18 wherein the
2 providing a thread pair associated with each of the at least one processors further
3 comprises associating each thread pair associated with a processor with a subgroup of
4 SLA processes of the SLA services module and a subgroup of gateways.

1 20. (Original) The program storage device of claim 18 wherein the
2 providing at least one processor further comprises providing a single processor, and
3 wherein the providing a thread pair associated with each of the at least one processors
4 further comprises providing a signal thread pair, wherein an inbound thread receives
5 signals from all gateways and provides a path to all processes of the SLA services
6 module.

1 21. (Currently Amended) A method for providing non-blocking, minimum
2 threaded two-way messaging, comprising:
3 providing at least one processor for controlling communication between SLA
4 processes of ~~the~~ an SLA services module and at least one I/O performance gateway; and
5 providing a thread pair associated with each of the at least one processors for
6 processing inbound signals from the at ~~least~~ least one I/O performance gateway being sent
7 to the SLA services module via an inbound thread and for processing outbound signals to
8 the at least one I/O performance gateway received from the SLA services module via an
9 outbound thread, wherein the inbound thread and the outbound thread operate
10 asynchronously to provide non-blocking messaging.

1 22. (Currently Amended) A storage area network, comprising:
2 storage means for providing storage of system data;
3 at least one application means for running an application thereon and for
4 accessing data on the storage means;
5 at least one gateway means, disposed between the at least one application host and
6 the storage subsystem, for intercepting I/O operations;
7 ~~means for storing service level agreements; and~~
8 means, coupled in parallel with the at least gateway means and the storage means,
9 for controlling the at least one ~~I/O performance~~ gateways means based on service level
10 agreements; and
11 means, coupled to the means for controlling the at least on gateway means, for
12 storing service level agreements, wherein the at least one gateway means sends statistic
13 data to the means for controlling and receiving I/O control requests from the means for
14 controlling to control I/O operations of the at least one gateway means;
15 wherein the means for controlling further comprises:
16 means, coupled to the means for storing service level agreements, for
17 managing and maintaining connections to the means for storing service level agreements;
18 means for analyzing data and controlling actions based on the service level
19 agreements and policy;
20 means for communicating with clients to provide ~~display~~ monitoring
21 information for presentation at an SLA client and for to provide communication ~~with~~
22 between the means for managing and maintaining connections to the means for storing

23 service level agreements and the means for controlling the at least one gateway means;
24 and
25 means, coupled to the means for controlling the at least one gateway
26 means, for communicating with the at least one gateway means to collect data and send
27 throttling requests based upon signals from the means for analyzing data and controlling
28 actions, wherein the means for communicating is configured to provide at least one
29 thread means for processing inbound signals from the at least one gateway means being
30 sent to the means for analyzing data and controlling actions via an inbound means and for
31 processing outbound signals to the at least one gateway means received from the means
32 for analyzing data and controlling actions via an outbound means, the inbound means and
33 the outbound means operating asynchronously to provide non-blocking messaging.

1 23. (Currently Amended) A Service Level Agreement (SLA) server,
2 comprising:
3 means, coupled to a means for storing service level agreements, for managing and
4 maintaining connections to ~~the~~ means for storing service level agreements and for
5 maintaining service level agreements and performance data in the means for storing
6 service level agreements;
7 means for analyzing data and controlling actions based on the service level
8 agreements and policy;
9 means for communicating with clients to provide display monitoring information
10 for presentation at an SLA client and ~~for~~ to provide communication ~~with~~ between the
11 means for managing and maintaining connections to the means for storing service level
12 agreements and the SLA client; and
13 means, coupled to the means for analyzing data and controlling actions, for
14 communicating with the at least one gateway means to collect data and send throttling
15 requests based upon signals from the means for analyzing data and controlling actions,
16 wherein the means for communicating is configured to provide at least one thread means
17 for processing inbound signals from the at least one gateway means being sent to the
18 means for analyzing data and controlling actions via an inbound means and for
19 processing outbound signals to the at least one gateway means received from the means
20 for analyzing data and controlling actions via an outbound means, the inbound means and
21 the outbound means operating asynchronously to provide non-blocking messaging.

1 24. (Original) A performance monitor for controlling communication
2 between two functional entities, comprising:
3 at least one processing means configured for processing signals between at least
4 one I/O performance gateway means and SLA services means; and
5 a thread means associated with each of the at least one processors, each thread
6 means processing inbound signals from the at least one I/O performance gateway being
7 sent to the SLA services module via an inbound means and for processing outbound
8 signals to the at least one I/O performance gateway received from the SLA services
9 module via an outbound means, the inbound means and the outbound means operating
10 asynchronously to provide non-blocking messaging.